Marker
Plug-In Units
PCM-7631A
PCM-7632A

KAY ELECTRIC CO.

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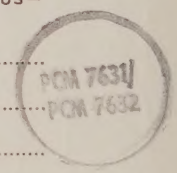

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INSTRUCTION MANUAL
ISSUE E

APRIL 1969

PCM-7631A & PCM-7632A

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KAY ELECTRIC COMPANY
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SECTION I

GENERAL INFORMATION

1.1 INTRODUCTION:

The PCM-7631 and PCM-7632 marker plug-in units are designed to operate in the MARKA-SWEEP Model 1500-C basic rack unit. Up to six fixed markers are available and may be used all at once or one at a time. A variable frequency marker may also be developed through the use of an external CW generator. Marker frequency range for the PCM-7631 is 10 KHz to 2 MHz and 1 KHz to 1 MHz for the PCM-7632. The PCM-7632 is especially useful for applications requiring marker separation as close as 1 KHz. Power and driving signals for the plug-in are furnished by the basic unit.

1.2 SHIPPING DAMAGE:

As soon as the marker generator is received, it is advisable to carefully inspect it for any possible shipping damage. A close check of the packing case is suggested to insure removal of all material. Any damage or shortage should be reported to the carrier and to Kay Electric Co..

1.3 EQUIPMENT SUPPLIED:

The marker generator is shipped completely assembled and ready for installation in the basic rack. Any auxillary equipment or interconnecting cables are not supplied.

1.4 SPECIFICATIONS:

A. PCM-7631A:

FREQUENCY RANGE:	10 KHz to 2 MHz.
FIXED MARKERS:	Up to 6, crystal, pulse type, individually switched.
FIXED MARKER FREQUENCIES:	Customer specified, or with standard frequencies of 0.5, 1. and 2 MHz.
MARKER SPACING:	Approximately 10 MHz minimum.
VARIABLE MARKER:	Provision for variable pulse-type marker developed through the use of an external CW generator.
MARKER AMPLITUDE:	Positive pulse, variable.
WEIGHT:	4 lbs.

B. PCM-7632A:

FREQUENCY RANGE:	1 KHz to 1 MHz
FIXED MARKER FREQUENCIES:	Customer specified
MARKER SPACING:	1 KHz

All other specifications as per PCM-7631A.

SECTION II

OPERATION

2.1 INTRODUCTION:

General operating instructions are furnished in the instruction manual provided with the basic rack unit(s) in which the PCM-7631A and PCM-7632A Marker Plug-in heads may be use. Specific identification and function of only those controls and terminals physically located on the marker heads are discussed here. However, since these controls and terminals have a direct relationship to those on the basic rack, both manuals should be referred to.

A. Installation of the Marker Plug-in in the Rack Unit is accomplished by pushing the plug-in into the receiving well as far as it will go. To lock the plug-in in place, turn the locking screw clockwise until it is tight. The plug-in may be removed from the rack unit by turning the locking screw counterclockwise to release it from the rack, and pulling the plug-in free.

2.2 CONTROLS AND TERMINALS (FRONT PANEL):

CONTROL	POSITION	FUNCTION
MARKERS Switch S1 - S6 for both.	ON-OFF	Used to select desired single frequency markers. Markers are active when switches are in UP position.
CW ADJ. Pot R32, PCM-7631A R33, PCM-7632A	VARIABLE	Used to adjust amplitude of variable marker pip. Should be set at lowest CCW setting which provides a stable marker pulse.
MARKER FREQ ADJ Screwdriver Adjustment R15 for both	VARIABLE	Used to maximize marker accuracy at selected sweep widths and REP RATES.
INT PIP Switch S7 for both	ON-OFF	Used to activate circuitry in sweep head which provides absorption type markers.

TERMINAL	FUNCTION
EXT OSC Input J3	Output from external CW generator is applied here to develop a variable marker. Requires 0.5 V rms at 70 ohms.

2.3 GENERAL OPERATING INSTRUCTIONS:

It is assumed that the marker head is fully seated in its receiving well in the rack unit.

Controls on the rack unit, sweep head and scope should be adjusted (as described in the manual for the basic rack) to obtain a stable, detected sweep trace on the scope face.

Markers at frequencies within the swept range in use may be superimposed on the trace by setting appropriate MARKER switches to the UP position. Marker pulse stability and amplitude may be adjusted by appropriately setting the PULSE ADJUST and PULSE LEVEL controls on rack unit. To insure maximum marker frequency accuracy the PULSE ADJUST control should be set at the closest CCW position providing stable marker pulses.

SWEEP WIDTH and SWEEP RATE affect marker accuracy and stability and it may be necessary to reset the PULSE ADJUST and MARKER FREQ ADJUST controls when width or rate is changed. A marker shift of approx. 500 Hz can be expected when switching SWEEP RATE from LINE LOCK to .01 Hz.

The markers are adjusted at the plant for maximum accuracy at approximately 20 KHz sweep width and rates below 10 Hz (PCM-7631A). Optimum accuracy for the PCM-7632A is checked at a frequency corresponding to three times the minimum marker spacing and will depend on the marker frequencies specified by the customer. Maximum marker accuracy at other sweep widths and rates can be accomplished by readjusting the MARKER FREQ ADJ control located on the front panel as outlined in the MAINTENANCE SECTION.

Should a variable frequency marker be desired, the output from an external CW oscillator is connected to the EXT OSC IN jack, J3 as in Fig. 2.1. The generator should be capable of delivering 0.5 V rms into 70Ω. The amplitude of the variable marker pip (which triggers the pulse generator in the rack) is adjusted by the CW ADJUST CONTROL, or by varying the amplitude of the CW signal directly at the generator. The lowest CCW setting which provides a stable marker should be used. Frequency is read directly from the CW oscillator tuning dial when the PCM-7631A is used. With the PCM-7632A, 500 Hz is added in the dial reading.

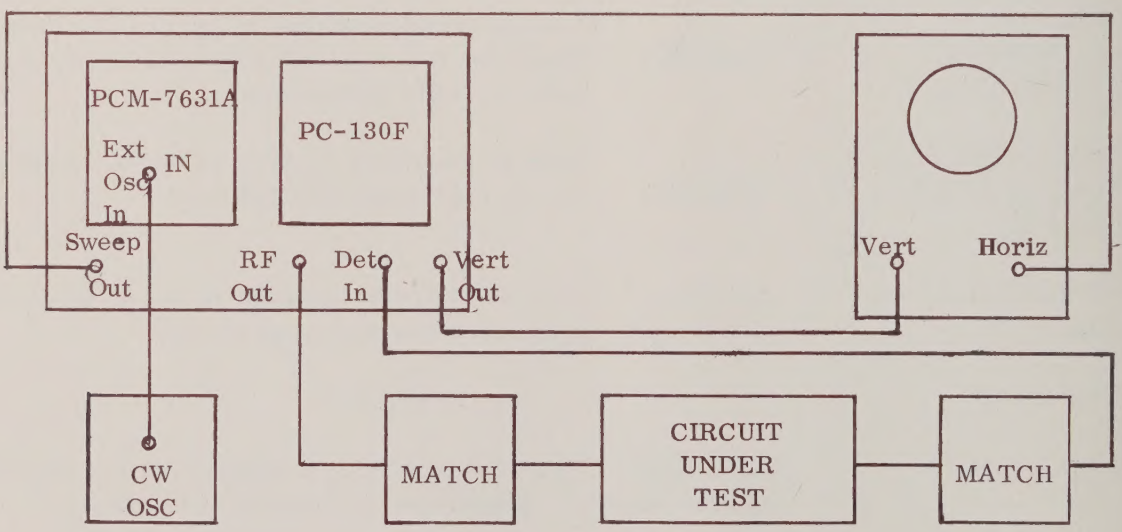


Fig. 2.1

Typical interconnection of equipment, using PC-130F sweep head and PCM-7631A marker head. The C-W oscillator is only required when a variable marker is needed. Use of impedance matching devices will depend on characteristics of the circuit under test.

SECTION III

CIRCUIT DESCRIPTION

3.1 OVERALL CIRCUIT DESCRIPTION:

The major circuits comprising the PCM-7631A and PCM-7632A, marker plug-in units are shown in Fig. 3.1. Heterodyne techniques are used to develop crystal-positioned fixed marker pips, and a variable frequency marker. Development of the fixed markers will be described first, and is based on the assumption that the PCM-7631A marker head and PC-130 sweep head are being used in the rack unit. Specific frequencies mentioned in the discussion will not hold if any other combination of plug-in units are used, however, the principle of circuit operation will be essentially the same.

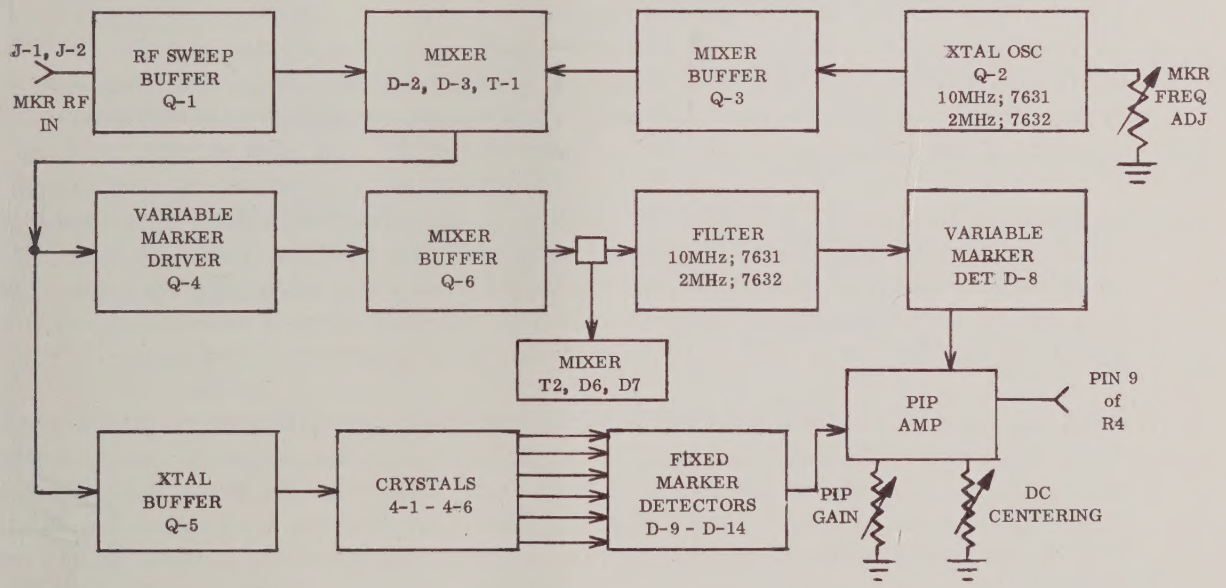


FIG. 3.1 BLOCK DIAGRAM

A. FIXED MARKERS

A swept frequency signal (100 Hz to 2 MHz) is applied to MARKER RF IN jack J2, fed through RF SWEEP BUFFER Q1, and applied to the MIXER composed of T1, D2 and D3. The second input to the MIXER is the 10 MHz signal from the MIXER BUFFER Q3 which derives its input from the 10 MHz CRYSTAL OSCILLATOR Q2.

MIXER output (Swept sum frequencies 10-12 MHz) is taken from L4 through CRYSTAL BUFFER Q5 which drives marker crystal bank. Marker crystals are cut 10 MHz above the indicated marker frequency.

As an example, consider an 11 MHz crystal switched into the circuit (to produce a 1 MHz marker). When the MIXER output (10-12 MHz) frequency coincides with the 11 MHz crystal frequency, the RF current through the crystal is detected and applied to the PIP AMPLIFIER which couples out of Pin 9 of P4 to the pulse generator in the 1500 rack.

Since the 10-12 MHz MIXER output is synchronized with the sawtooth output (Horiz. output) from the rack unit and used to drive the horizontal input of the oscilloscope, the marker appears at the center of the 100 Hz - 2 MHz sweep as seen on the scope or at 1 MHz.

The pip height and displacement are adjusted by PIP GAIN CONTROL R33, and D.C. CENTERING CONTROL R34, respectively.

B. VARIABLE MARKER

The variable marker is developed by applying the output of a 10 KHz - 2 MHz CW oscillator to the EXT OSC jack, J3. This CW signal is coupled through the CW ADJUST CONTROL R32, to the VARIABLE MARKER MIXER (T2, D6, D7) where it is heterodyned with the 10-12 MHz sweeping signal. The difference frequencies are coupled to a 10 MHz filter composed of Y8, L6 and C27.

As an example, consider a 1 MHz CW input at J3, mixed with the 10-12 MHz sweeping signal, producing difference frequencies between 9 and 11 MHz. These swept difference frequencies are coupled out to the 10 MHz FILTER which passes an RF pulse each time the sweeping frequencies pass 10 MHz, the resultant pulse is detected by D8 amplified by the PIP AMP. and coupled out to the pulse generator in the rack.

Since the swept 10-12 MHz input to the MIXER is synchronized with the sawtooth voltage used to drive the horizontal input of the scope, the 1 MHz variable freq. marker will appear at the center of the 100 Hz - 2 MHz sweep trace on the scope face. Marker frequency is read directly on the CW generator tuning dial. In the case of the PCM-7632A, add 500 Hz to the generator dial to obtain correct variable marker pulse frequency.

The front-panel CW ADJUST CONTROL is used to adjust the amplitude of the CW signal applied to the MIXER. This signal should be at least 0.5 V rms (into 70Ω). The CW ADJUST CONTROL is set so that the variable marker pulse just appears, with the PULSE ADJ CONTROL on the rack set for normal operation of the fixed markers.

C. INTERNAL (ABSORPTION) MARKERS

The internal PIP-OFF switch S7 is used to activate circuitry in the sweep oscillator head which blanks the R. F. carrier, thus producing "notches" in the swept output at the same frequencies as the fixed marker pips. The above circuitry is described in the manuals provided with the sweeping oscillator heads.

The variable marker may be used with fixed markers for absorption markers.

SECTION IV

MAINTENANCE

4.1 INTRODUCTION:

The instructions furnished in this manual may be used in conjunction with those provided for the basic rack. In order to make voltage measurements, the marker head is operated removed from the rack unit. This can be accomplished by using a multiconductor cable fitted with compatible with those on the rack and plug-in. (An extension cable P/N 8085 is available, at extra cost, from the factory.)

If the instrument seems defective in any respect, first determine that the cause is not in the associated equipment, or in the connections between equipment. Check the power supply voltages, as described in the manual for the basic rack, and reset if necessary.

4.2 ALIGNMENT PROCEDURE:

The following procedure relates specifically to the PCM-7631A, however, the PCM-7632A may be aligned by substituting the proper frequencies. Since the marker frequencies are normally customer specified no specific frequency will be discussed. Note also, that the circuit symbol numbers mentioned are for the PCM-7631A, their counterparts can be determined by referring to the PCM-7632A schematic.

A. EQUIPMENT

1. CRO
2. VTVM
3. FREQUENCY COUNTER
4. CW GENERATOR 10 KHz to 2 MHz
5. EXTENSION PATCH CORD
6. 70 ohm ATTEN.

B. ALIGN CRYSTAL OSCILLATOR Q2, Q3

1. Connect an R. F. detector (through a 500pf capacitor) to the emitter of Q3.

    a. Adjust L3 for maximum oscillator output (4 V p-p at 10 MHz to 2 MHz)

C. ALIGN MIXER

1. Connect vertical input of scope to TP-1 (Pin 9 of P4). Turn pulse ADJ control on rack fully CCW.

    a. Adjust DC center control R34, to produce baseline 40 mv above ground.
    b. Set pip gain control R33 at mid-range.
    c. Pip height controls R41, R44, R47, etc. mid-range.
    d. Tune C13 and L4 for maximum uniform height across the sweep range using a REP-RATE of approximately 0.5 sec..
    e. Adjust each pip height control (R41, R44, R47, etc.) so that all pips are exactly the same height.

D. CALIBRATION OF FIXED MARKERS:

a. Connect freq. counter to emitter of Q3 through a 500pf capacitor.
b. Set MARKER FREQUENCY ADJ. control R14 fully CCW and tune L1 for 1.999870 MHz.
c. Set R14 fully clockwise, frequency should be approx. 2.000250 MHz.

1. The following applies for both PCM-7631, PCM-7632

a. Interconnect equipment as in Fig. 4.1. Set the PULSE ADJ. control on rack to lowest setting that provides stable markers.
b. Set sweep oscillator center freq. to frequency of lowest marker with about a 20 KHz sweep width and a 5 Hz sweep rate.
c. Switch on the lowest frequency marker.

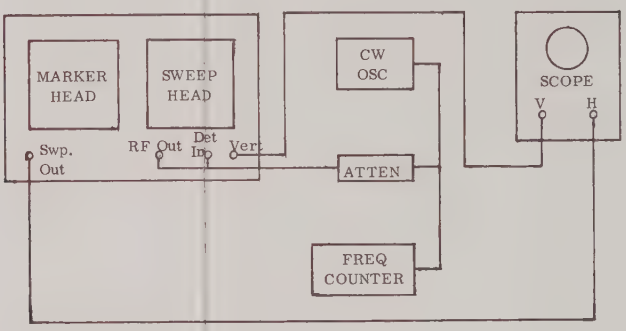


FIG. 4.1

d. Set attenuator for suitable birdie amplitude, while providing isolation between sweeping RF output and counter.
e. A marker pulse and a beat from the CW generator should appear on the scope face.

NOTE: For extremely low marker frequencies it may be necessary to connect a 0.01μf capacitor across the vertical output to bypass the audio component of the zero beat.

f. Set the CW oscillator to the exact frequency of the marker to be calibrated.
g. Set MARKER FREQ ADJUST control R14 at its mid-range.
h. Adjust L2 so that marker pulse conincides exactly with the center of the zero beat. Make sure that the PULSE ADJ. control is at lowest setting which provides a stable marker pulse.
i. Set SWEEP RATE to LINE LOCK and determine that the MARKER FREQ. ADJUST control has sufficient range to pull the marker on frequency. Reset SWEEP RATE to 5 Hz.
j. Check frequency of remaining markers using above procedure.

NOTE: It may be necessary to readjust DC CENTER control R34, PIP GAIN control R33 and individual pip height controls to maintain reliable triggering at all REP RATES. For LOG SWEEP, individual pip height controls must be readjusted for uniform pip height.

E. ALIGNMENT OF VARIABLE MARKER, PCM-7631A

1. Connect CW generator to EXT oscillator input.
2. Provide 0.5 V rms RF output from the CW generator and rotate the PULSE ADJ control in the rack fully CCW.

   a. Set SWEEP WIDTH to approx. 200 KC.
   b. Set SWEEP RATE to 5 Hz.

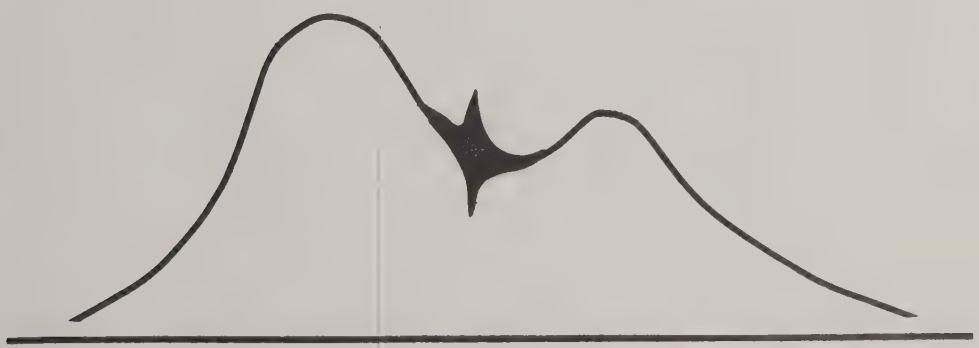
3. Connect the Vertical Input of the scope to Pin 9 of P4.

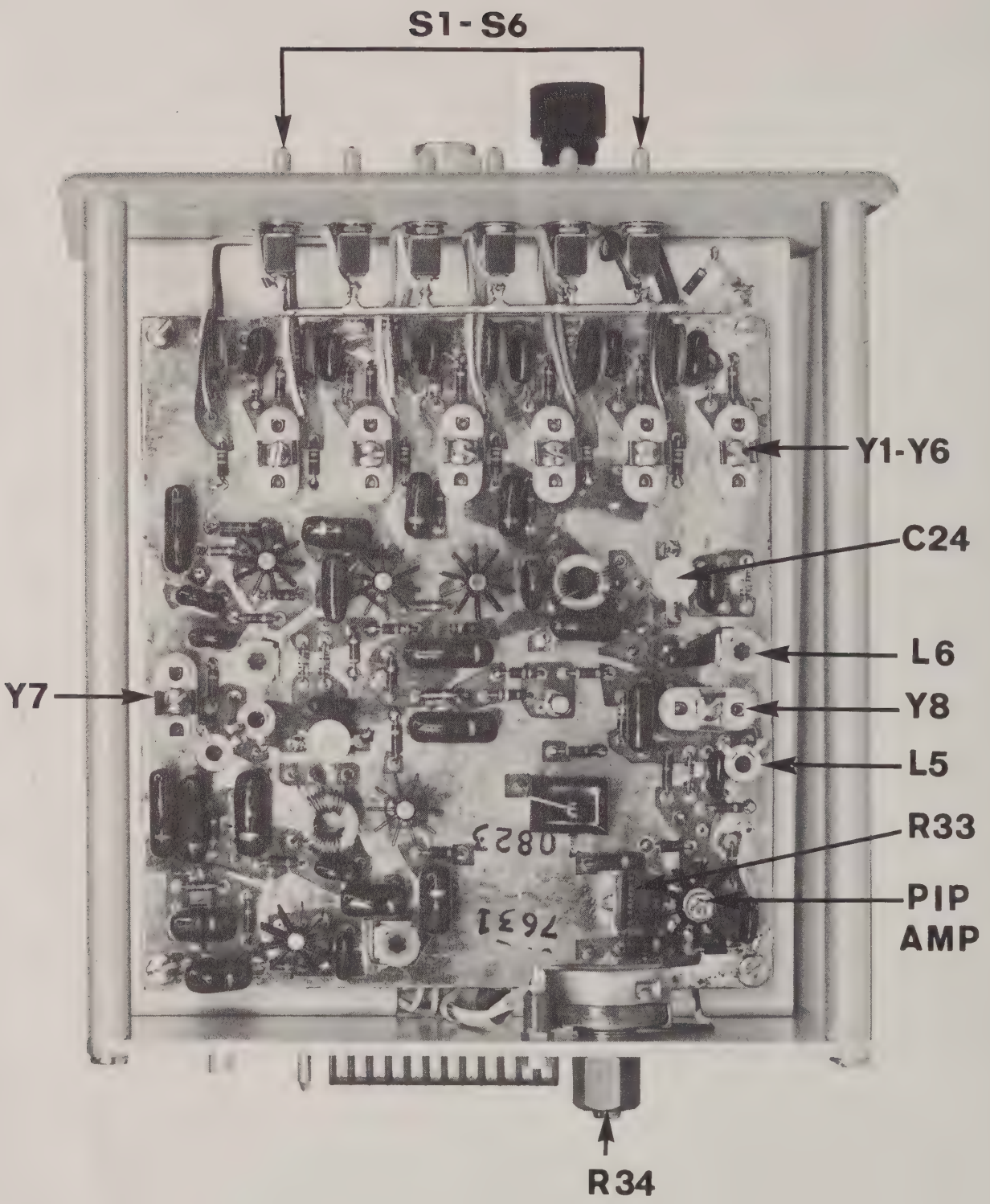
   a. Tune CW generator frequency so that the variable marker pip appears in center of trace.
   b. Note that the pip has two peaks with a zero-beat appearing in the center. (See Fig. 4.2)
   c. Tune C24 for maximum amplitude of the left peaks.
   d. Tune L6 so the beat falls in the valley between both peaks.

4. To check the variable marker frequency, choose a convenient fixed marker to use as a reference.

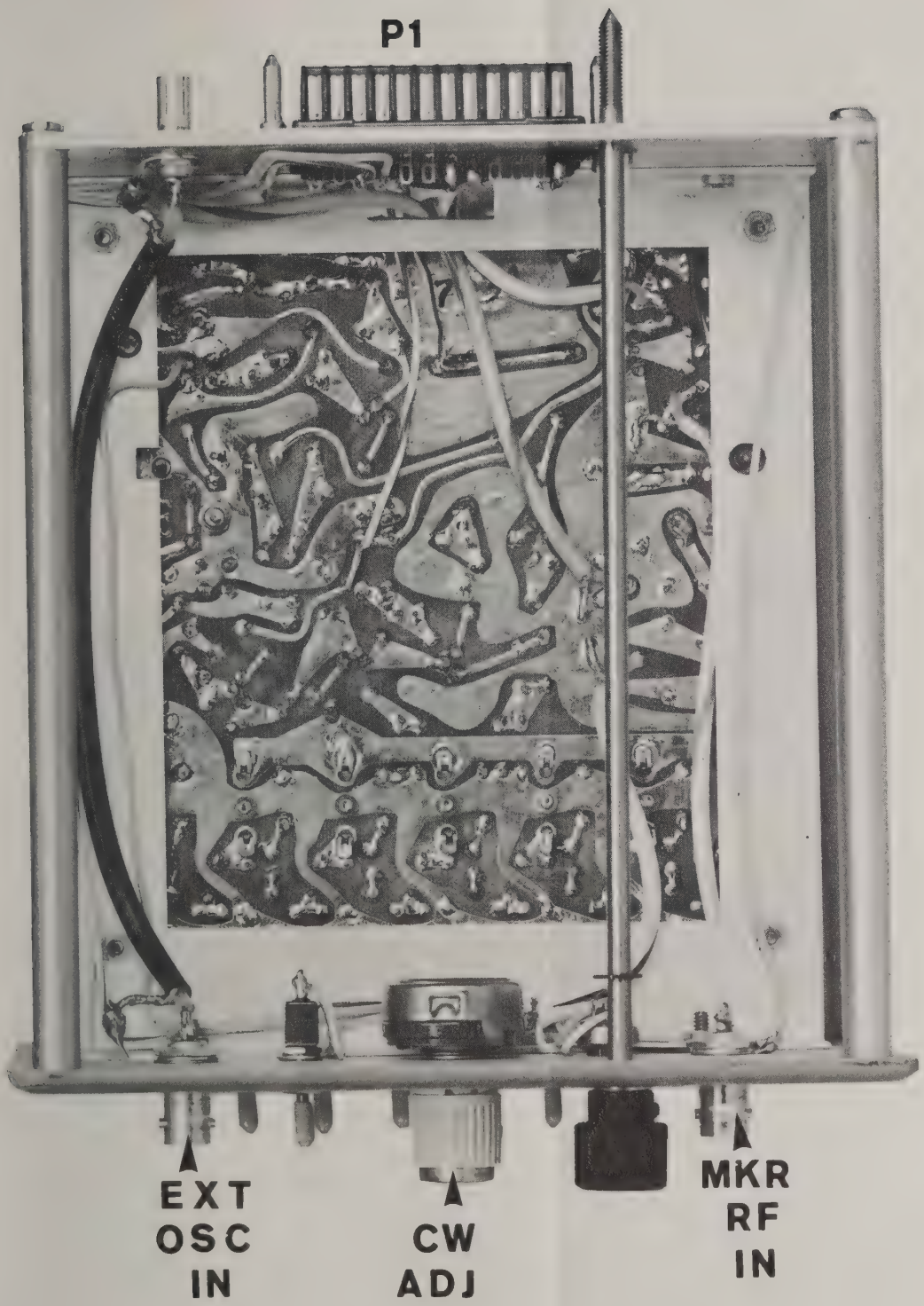
   a. Using method outlined in section D set CW oscillator to FIXED MARKER FREQUENCY and mark its position on the scope face.
   b. Connect CW oscillator to EXT OSCILLATOR INPUT J3 and then L6 so that the variable marker pulse falls within approx. 1% of the fixed marker.

   NOTE: Care should be taken when tuning L6 so that the zero-beat shown in Fig. 4.2 remains on the skirt of the pip. If the beat appears on top of the pip, the variable marker pulse will be unstable.

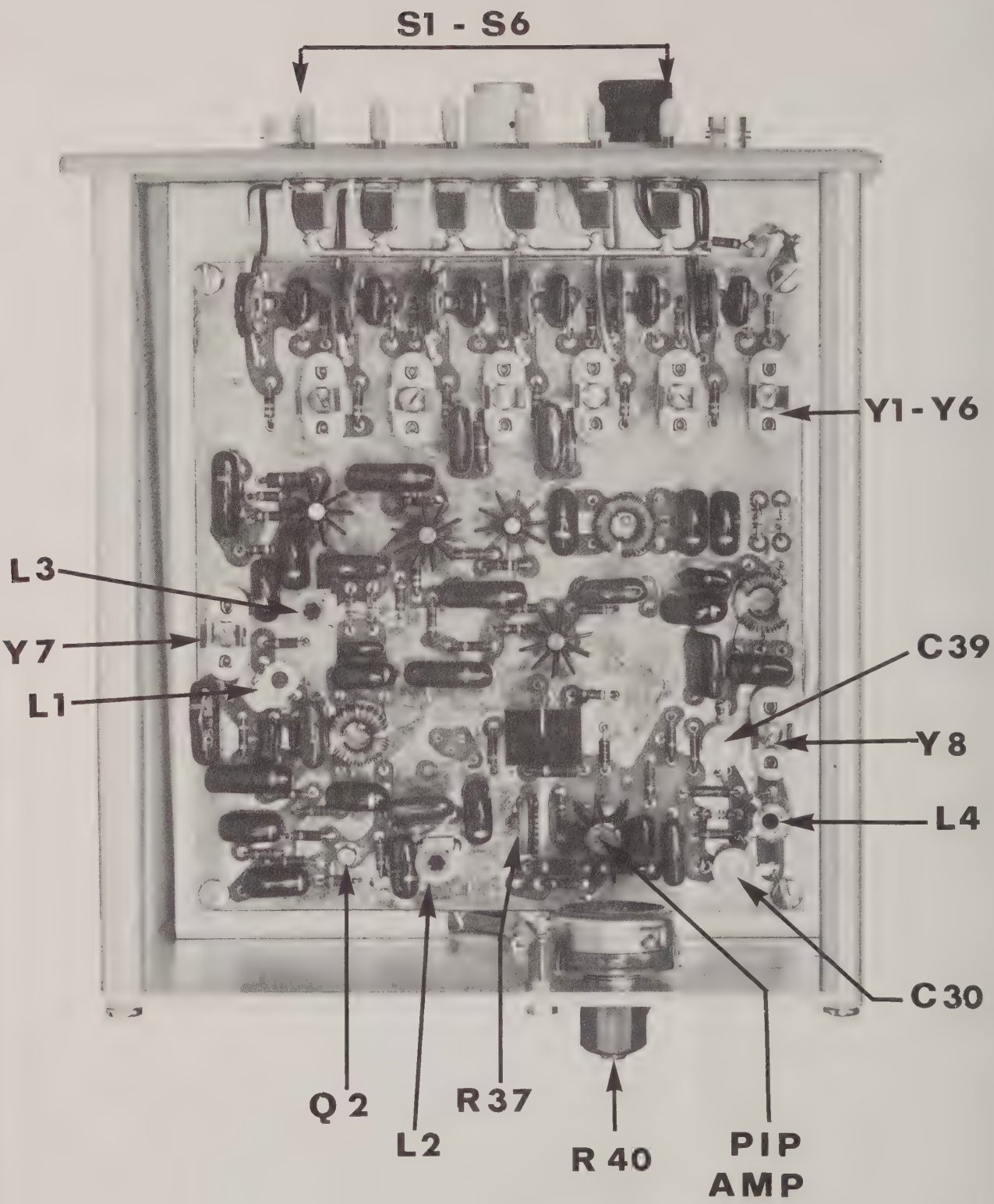




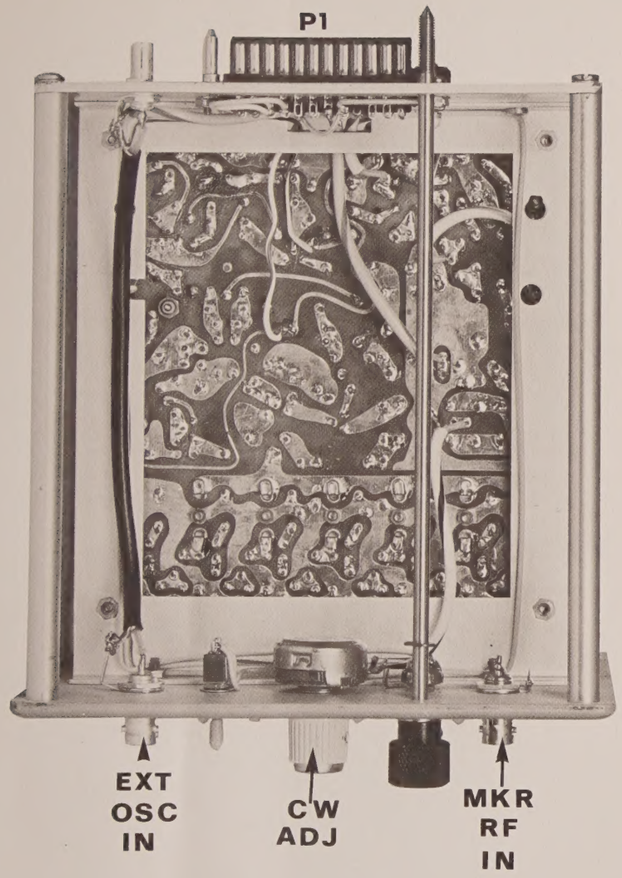
TOP VIEW OF CHASSIS, PCM-7631A



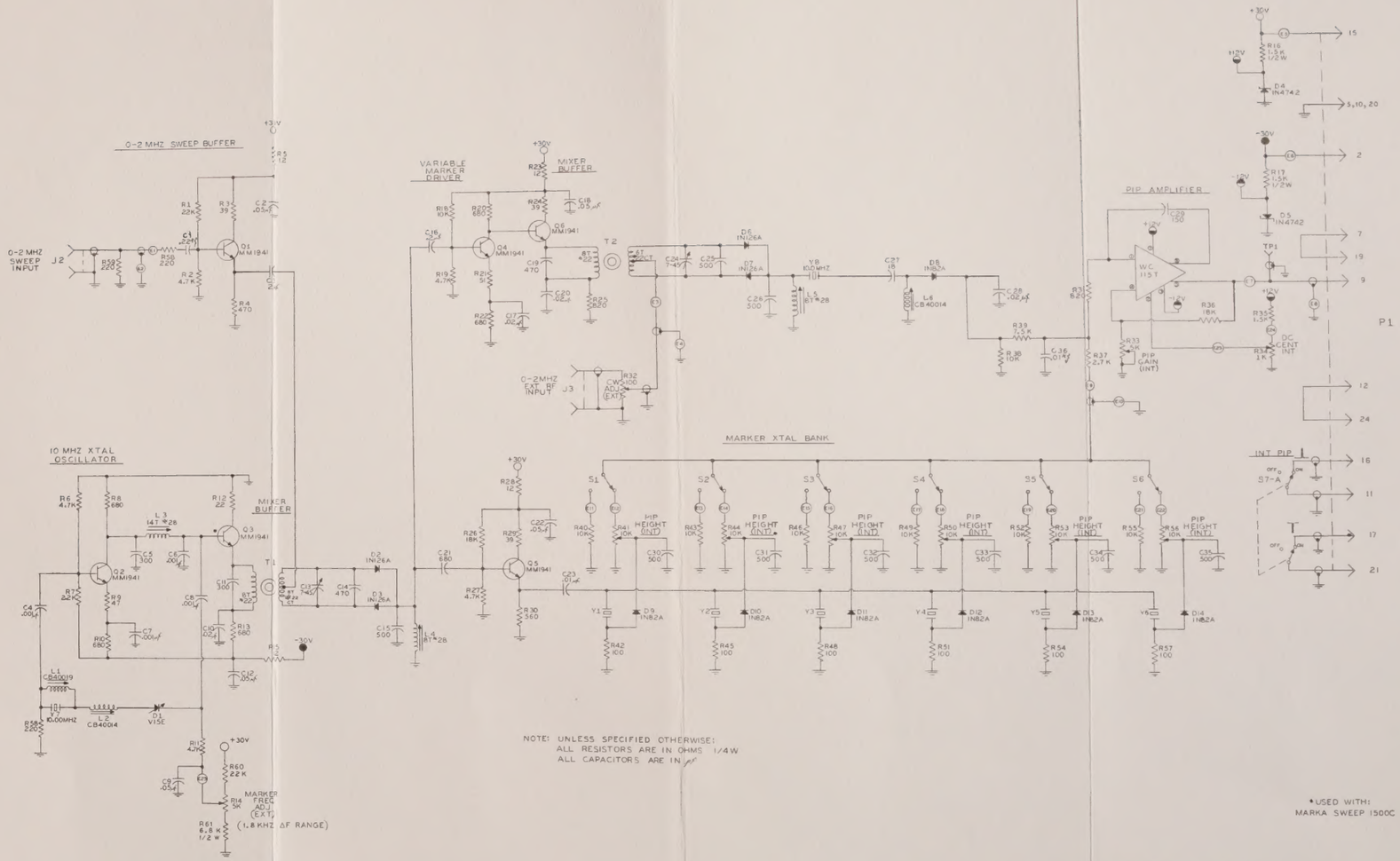
BOTTOM VIEW OF CHASSIS, PCM-7631A



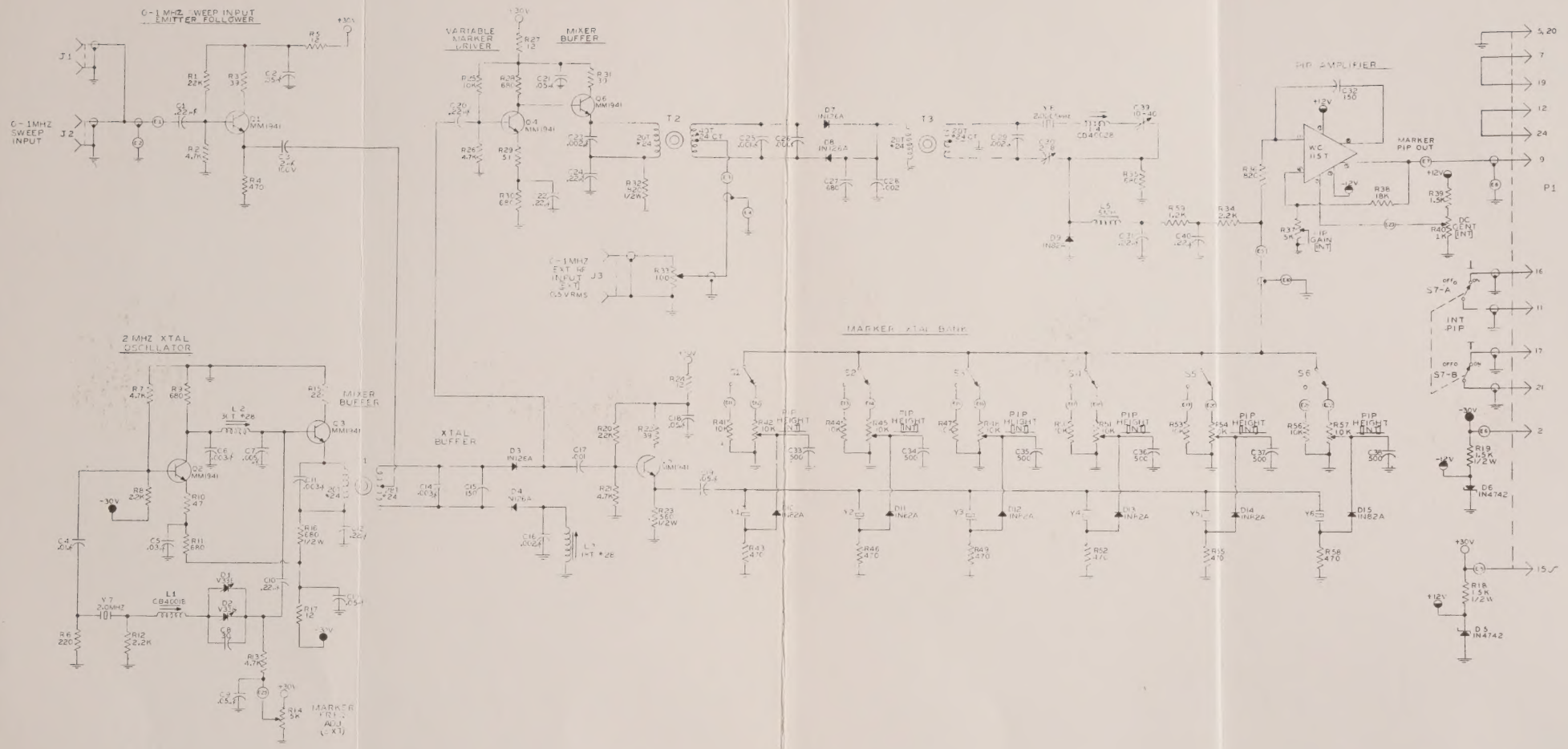
TOP VIEW OF CHASSIS, PCM-7632A



BOTTOM VIEW OF CHASSIS, PCM-7632A



MARKER HEAD, PCM-7631A, DWG. # D10996B



NOTE: UNLESS SPECIFIED OTHERWISE:
1. ALL RESISTORS ARE IN OHMS 1/4 W
2. ALL CAPACITORS ARE IN μf

* USED WITH:
MARKA SWP 1500 RACK

MARKER HEAD, PCM-7632A, DWG. # D 10994B

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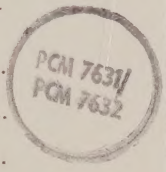

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